M. E. EMBEDDED SYSTEMS

M.E. Embedded Systems							
	BITS G553	Real Time Systems	5	BITS G540	Research Practice	4
	EEE G512	Embedded System Design	4	CS G523	Software for Embedded Systems	5
I		Elective	*	MEL G642	VLSI Architecture	5
		Elective	*		Elective	*
			17			18
	EEE G626	Hardware Software Co-Design	5	BITS G629T	Dissertation	16
		Elective	*		or	Or
II		Elective	*	BITS G639	Practice School	20
		Elective	*			
			17			16/20

LIST OF COURSES

CORE COURSES

		L P U
BITS G553	Real Time Systems	5
CS G523	Software for Embedded Systems	5
EEE G512	Embedded System Design	3 1 4
EEE G626	Hardware Software Co-Design	5
MEL G642	VLSI Architecture	5

ELECTIVE COURSES (ANY SIX)

BITS F415	Introduction to MEMS	4
CS G541	Pervasive Computing	4
CS G553	Reconfigurable Computing	5
CS G611	Distributed Processing Systems	2 2 4
CS G612	Fault Tolerant System Design	2 3 5
EEE F434	Digital Signal Processing	3 1 4
EEE G547	Device Drivers	3 2 5
EEE G572	Digital Signal Processing	3 2 5
EEE G594	Advanced VLSI Devices	5
EEE G595	Nanoelectronics and Nanophotonics	5
EEE G613	Advanced Digital Signal Processing	5
EEE G625	Safety Critical Embedded System Design	4
EEE G627	Network Embedded Application	4
MEL G531	Testable Design and Fault Tolerant Computing	3 2 5
MEL G621	VLSI Design	3 2 5
MEL G622	Introduction to Artificial Neural networks	2 2 4
MEL G623	Advanced VLSI Design	5
MEL G624	Advanced VLSI Architectures	5
MEL G626	VLSI Test and Testability	5
MSE G511	Mechatronics	3 2 5

COURSE DESCRIPTION:

CORE COURSES L P U

BITS G553 Real Time Systems 5

Real time software, Real time operating systems scheduling, virtual memory issues and file systems, real time data bases, fault tolerance and exception handling techniques, reliability evaluation, data structures and algorithms for real time/embedded systems,

programming languages, compilers and run time environment for real time/embedded systems, real time system design, real time communication and security, real time constraints and multi processing and distributed systems.

CS G523 Software for Embedded Systems 5

Real-time and embedded systems; software issues in embedded system; software development process; requirement analysis: use cases, identification and analysis of use cases, use case diagrams; design: architectural design, design patterns and detailed design; implementation: languages, compilers, runtime environments and operating systems for embedded software; testing: methodologies, test cases. The course will also consist of laboratory practices and development of software for embedded systems.

EEE G512 Embedded System Design 3 1 4

Introduction to embedded systems; embedded architectures: Architectures and programming of microcontrollers and DSPs. Embedded applications and technologies; power issues in system design; introduction to software and hardware co-design.

EEE G626 Hardware Software Co-Design 5

FPGA and ASIC based design, Low-Power Techniques in RT Embedded Systems On-chip networking. Hardware Software partitioning and scheduling, Co-simulation, synthesis and verifications, Architecture mapping, HW-SW Interfaces and Re-configurable computing.

MEL G642 VLSI Architecture 5

Overview of CISC processor architectures; Instruction set architecture of CISC processor; hardware flowcharting methods; implementing microprocessor logic from hard-ware flowcharts; RISC instruction set architecture; Pipelined execution of RISC instructions; pipeline execution unit design; control hazards; design of memory hierarchy.

ELECTIVE COURSES (ANY SIX)

BITS F415 Introduction to MEMS 4

Overview, history and industry perspective; working principles; mechanics and dynamics, thermofluid engineering; scaling law; microactuators, microsensors and microelectro mechanical systems; microsystem design,modeling and simulation; materials; packaging; microfabrication: bulk, surface, LIGA etc; micromanufacturing; microfludidics; microrobotics;case studies.

CS G541 Pervasive Computing 4

Select application architectures; hardware aspects; human-machine interfacing; device technology: hardware, operating system issues; software aspects, java; device connectivity issues and protocols; security issues; device management issues and mechanisms; role of web; wap devices and architectures; voiceenabling techniques; PDAs and their operating systems; web application architectures; architectural issues and choices; smart card-based authentication mechanisms; applications; issues and mechanisms in WAP-enabling; access architectures; wearable computing architectures.

CS G553 Reconfigurable Computing 5

Overview of Programmable Logics. FPGA fabric architectures. Logic Elements and Switch Networks. Design and Synthesis of Combinational and Sequential Elements. Placement and Routing. Pipelining and other Design Methodologies. Fine-grained and Coarse- Grained FPGAs. Static and Dynamic Reconfiguration. Partitioning. Hardware/Software Portioning and Partial Evaluation. Systolic Architectures.

CS G611 Distributed Processing Systems 2 2 4

Concepts of distributed processing, networkable architectures, inter process and processor communication algorithms, process migration and porting techniques etc.

CS G612 Fault Tolerant System Design 2 3 5

Principles of fault tolerant systems, redundancy, parallel and shared resources, spatial systems, configurations, design aspects etc.

EEE F434 Digital Signal Processing 3 1 4

Introduction; design of analog filters; design of digital filters (IIR and FIR); structures for the realization of digital filters; random signals and random processes; linear estimation and prediction; Wiener filters; DSP processor architecture; DSP algorithms for different applications.

EEE G547 Device Drivers 3 2 5

Introduction to operating system, Introduction to Linux Basics, commands, file system , kernel and introduction to Android, Process Synchronization ,Semaphores, Message Passing, Mailboxes and debugging, Module programming/ Shell programming / Character Device Driver, Timing and Interrupts, Device Driver Programming as applicable to Linux/ Android/ Windows, Parallel/ Serial Port Driver/ Block /USB /NETWORK/ PCI/ Drivers, tty Subsystem. Prerequisite: EEE G512 Embedded system design

EEE G572 Digital Signal Processing 3 2 5

EEE G594 Advanced VLSI Devices 5

Device physics of and engineering of advanced transistors, review of metal oxide semiconductor (MOS) with quasi-ballistic and ballistic transport, Shortchannel effects (SCEs) in nanometer regime, scaled MOSFETs, Device physics and engineering of sub- 100nm MOSFETs , Limits of the state-of-the-art silicon device technology, issues in the miniaturization, Alternative device structures ,non-conventional MOSFETs, and transport in novel nanodevices. Analytical expression (supported by TCAD simulation) for the onedimensional transport and interpretation of novel device characteristics.

EEE G595 Nanoelectronics and Nanophotonics 5

Semiconductor Fundamentals, Band Theory, Quantum Structures and Quantum Mechanics, Transport in Quantum Structures, Optical Properties of Semiconductor Quantum Structures, Strain Engineering, Electro- Optic Effects, Photonic / electronic Devices based on Nano structures.

EEE G613 Advanced Digital Signal Processing 5

Review of stochastic processes, models and model classification, the identification problem, some field of applications, classical methods of identification of impulse response and transfer function models, model learning techniques, linear least square estimator, minimum variance algorithm, stochastic approximation method and maximum likelihood method, simultaneous state and parameter estimation of extended kalman-filter, non-linear identification, quasi linearization, numerical identification methods.

EEE G625 Safety Critical Embedded System Design 4

EEE G627 Network Embedded Application 4

This course deals with the three main application areas of Network Embedded Systems – Wireless Sensor Networks, Automotive Networks, and Industrial Networks– Network Architecture , Deployment Issues, Network Protocol stack: Modular and Cross Layer Design. Network Node: Architectures, Operating System and Applications. Middleware Issues and Design. Security and Encryption

MEL G531 Testable Design and Fault Tolerant Computing 3 2 5

Fault: types, modelling and simulation; testing methodologies, coverage, economics and quality; test vector generation: design for testability, built-in self tests; fault tolerant computing; fault tolerant software.

MEL G621 VLSI Design 3 2 5

Introduction to NMOS and CMOS circuits; NMOS and CMOS processing technology; CMOS circuits and logic design; circuit characterization and performance estimation; structured design and testing; symbolic layout systems; CMOS subsystem design; system case studies.

MEL G622 Introduction to Artificial Neural networks 2 2 4

Fundamentals and definitions; Perceptrons, backpropagation and counterpropagation Networks; Statistical methods for network training; Hopfield nets; Associative memories; Optical neural networks; Applications of neural networks in speech processing, computer networks and visual processing.

MEL G623 Advanced VLSI Design 5

Deep submicron device behavior and models, Interconnect modeling for parasitic estimation, Clock signals and system timing--Digital phase locked loop design, memory and array structures, Input/output circuits design, ASIC technology, FPGA technology, High speed arithmetic circuits design,-Parallel prefix computation, Logical effort in circuit design, Low power VLSI circuits-Adiabatic logic circuits, Multi threshold circuits, Digital BICMOS circuits, Design of VLSI systems.

MEL G624 Advanced VLSI Architectures 5

Instruction set design and architecture of programmable DSP architectures; dedicated DSP architectures for filters and FFTs; DSP transformation and their use in DSP architecture design; Application Specific Instruction set Processor; superscalar and VLIW architectures.

MEL G626 VLSI Test and Testability 5

Fault models and types; automated test generation for combinational logic; test generation for sequential logic; need for adding testability logic; design for testability; Adhoc DFT methods; structured DFT; test generation for delay fault; issues in analog circuit testing and testability.

MSE G511 Mechatronics 3 2 5

Concepts of measurement of electrical and nonelectrical parameters; displacement, force, pressure etc. and related signal conditioning techniques, drives and actuators, concepts of microprocessors/ microcontrollers architecture and programming, memory and I/O interfacing. System design concepts through case studies.